#3

SAIC0041-US

SPATIALLY INTEGRATED RELATIONAL DATABASE MODEL WITH DYNAMIC SEGMENTATION (SIR-DBMS)

BACKGROUND OF THE INVENTION

Field of the Invention

[0001] The present invention relates to database management systems and their use with transportation information systems and spatial geographic information, and more particularly to a spatially integrated relational database using dynamic segmentation for associating linear and spatial information and a method for using the database system with spatial data methods.

Description of the Related Art

[0002] Commercial relational database management systems have recently provided the ability to store spatial data, but do not support full dynamic segmentation. Commercial graphical information systems (GIS) have provided the ability to store both spatial and relational data, but only in proprietary formats. An anchor section is an underlying spatial referencing mechanism for linear data. In terms of a road network, an anchor section represents a physical section of a roadway, typically a section that connects two intersections.

[0003] Commercial GISs do not maintain permanent anchor sections. Currently, GISs break existing anchor sections when a new intersection is identified along an existing anchor section. This proliferates the number of anchor sections, and

consequently the size of the database, and also reduces database performance due to this segmentation of anchor sections.

[0004] GIS applications have traditionally used a link-node network to represent road networks, where a link represents a section of road. A node, which occurs at the ends of the link, represents either an intersection between links or the end of a road. Because nodes (i.e., intersections) can only occur at the ends of a link, most changes to a road network require splitting of existing links. For example, adding a new intersection in the middle of an existing link requires that the link be split at the intersection point to form two links. Splitting a link has serious adverse consequences. Any references to the original link (e.g., the assignment of a pavement type to a portion of the link) become invalid. In the case of a single data repository, complex data maintenance activities can automatically correct for these changes. However, in a distributed data environment, an automated correction methodology is not feasible.

[0005] Many GIS applications use proprietary implementations of dynamic segmentation to associate data values with locations in a roadway. A disadvantage of using such proprietary solutions is that the data within the GIS application is inaccessible to other applications, limiting access to the data by non-GIS users, and making the data more difficult to integrate with other non-GIS data.

[0006] Many applications provide access to historical data through periodic snapshots that are stored off-line, thus limiting access to historical data and making it more difficult to perform analyses that integrate historical and current data.

[0007] In 1994, the Georgia Department of Transportation (GDOT) initiated a strategic planning process that identified improvements necessary to achieve a greatly improved transportation program. As a result of this strategic planning effort GDOT worked with Georgia Institute of Technology (GTECH) to prepare "A Strategic Plan for Developing a Comprehensive GDOT Transportation Information System (TIS)", also called the "Plan", and herein incorporated by reference in its entirety. The Plan examined technologies and processes used for information protocols, data collection, data formats and standards, and communications in the department. The Plan recommended implementation of a transportation information system (TIS) to upgrade data integration, utility and quality of information applications and resources.

[0008] GDOT's intention is to share the products of information technology (IT) efforts with other state agencies and the private sector. The state of Georgia is actively developing statewide IT programs that will result in better service delivery and more efficient government. Georgia's IT programs will employ GIS maps developed by GDOT. The maps are also available to the private sector. Two initial systems to be developed were the Transportation Systems and Facilities (TSAF) system and the Transportation Projects subsystem (TPro), the functional specifications of which are in the aforementioned Plan.. These two (2) systems combine to create a TIS core module (CM). It is within this context that that an embodiment of the present invention is described.

[0009] The Transportation Systems and Facilities (TSAF) system, part of the Transportation Information System (TIS) for the Georgia Department of